SEASONAL VARIATION IN CHEMICAL COMPOSITION OF IPIL–IPIL (*LEUCAENA LEUCOCEPHALA*)

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Abstract

Samples of Ipil-Ipil (*Leucaena leucocephala*) grown at PFRI Faisalabad were collected bimonthly for two consecutive years to assess variation in chemical composition of twigs and leaves. Chemical analysis indicated composition of 27 to 32 percent Dry Matter (DM), 23 to 28 percent Crude Protein (CP), 4 to 6 percent Ether Extract (EE), 20 to 26 percent rue Fibre (CF), 7 to 11 percent Ash and 32 to 37 percent Nitrogen-Free Extract (NFE) during different months. However, the variation in composition among different months was statistically non-significant.

Introduction

The current status of animal protein deficiency in developing world is caused by lack of forage. Trees and shrubs play dual role serving both as shade and forage supply for livestock. During dry season, shrubs and trees provide green fodder i.e. twigs, leaves flowers, fruit etc., often rich in protein, vitamins and minerals. However, during non-availability season, animals depend upon straw only from native grasses and this poor feed causes avitaminosis, mineral deficiencies and severe debilitation.

Ipil Ipil (*Leucaena leucocephala*) is a deep-rooted tree or arborescent shrub upto 10 m high. It is native to Mexico, but cultivated widely in the tropics as fodder plant especially on dry wastelands where little else will grow (Gohl, 1981). Ipil-ipil is a fast growing evergreen fodder tree with high protein content. It serves as fodder in the extreme season. Dry matter yield of 25-30 t/ha/year can be obtained by planting it at 1×1 m spacing. (Mohammad, 1989). Pure fodder intake of Ipil-ipil is generally not recommended due to mimosine contents in its leaves which causes shedding of wool and hair when consumed in large amounts (Singh, 1982). However, the mimosine content can be reduced by soaking it in water and drying (Gohl, 1981). Lim (1967) and Bhannasiri (1970) while studying chemical composition of fresh leaves and twigs of Ipil-ipil concluded that DM ranged 30.7-31.6%, CP 21-27%, CF 10-24.2%, Ash 3.5-8.9%, EE2.7-6.5% and NFE 30.0-55.1%. Kharat *et al.* (1980) found 22.22% CP, 3.56% EE, 46.3%

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Neutral Detergent Fibre and 29.79% Acid Detergent Fibre in Ipil-ipil. Sharma (1990) observed that leaves of Ipil-ipil contained 30.7% DM, 22.8% CP, 14.5% CF, 3.3% EE and 47.6% NFE.

Chemical composition of leaves varies in different months but the change in chemical composition at different localities is not regular as it is influenced by edaphic and climatic changes (Singh and Mudgal, 1967). Chemical composition is a fair indicator of feeding value of a plant species. Information on seasonal variation in chemical composition provides a guideline for utilizing tree fodders at specific stages to ensure optimum use. Little literature is available about seasonal variation in chemical composition of twigs and leaves of different species. The present study was, therefore, conducted with the objective to determine seasonal variation in proximate constituents of twigs and leaves of Ipil-ipil.

Material and Methods

Ipil-ipil raised during 1986-87 in the arboretum of Punjab Forestry Research Institute, PFRI, Faisalabad was selected for this study. Random samples of green leaves and twigs (less than 15 cm in length) were collected bimonthly from different trees (January, March, May, July, September and November) for two years, i.e., from 1997 to 1998. The samples were weighed immediately after cutting and preserved in paper bags and marked for identification. The samples were dried in an oven at 65°C to a constant weight. The difference between fresh and dry weight indicated the moisture content of the samples. The dry matter present was thus calculated by the following formula:

$$\text{Dry matter percentage} = \frac{\text{Dry weight}}{\text{Fresh weight}} \times 100$$

The dried samples were ground to 1.0 mm mesh and preserved for proximate analysis (AOAC, 1984) for the following constituents:

1. Crude Protein (CP) %
2. Crude Fibre (CF) %
3. Ether Extract
4. Ash %
5. Nitrogen-Free Extract (NFE) %

The proximate analysis for the above constituents parameters was done thrice and the mean values were taken.

Results and Discussion

Table 1 gives variation in chemical composition of twigs and leaves of Ipil-ipil. The average values of proximate constituents are also presented in Fig.1.

Table 1. Variation in chemical composition

Month	DM	CP	CF	EE	ASH	NFE
January	32.33	25.42	25.96	4.48	9.96	34.18
March	32.37	27.18	23.90	4.97	7.45	36.50
May	41.16	25.19	26.98	4.33	10.59	32.91
July	28.21	23.92	26.27	5.90	7.80	36.11
September	28.04	27.95	21.27	4.12	8.95	37.71
November	27.21	28.08	20.22	5.10	8.70	37.90

Dry matter

The mean values of DM% varied from 27.21 to 32.37. The minimum DM% was found in November. A decreasing trend in DM% was observed from January to November, however, the variation was statistically non-significant. This was attributed to more fibre and ash contents in the predominantly old leaves of the tree in January. Since the growth of new leaves was more in summer, the new leaves contained less dry matter and more moisture contents.

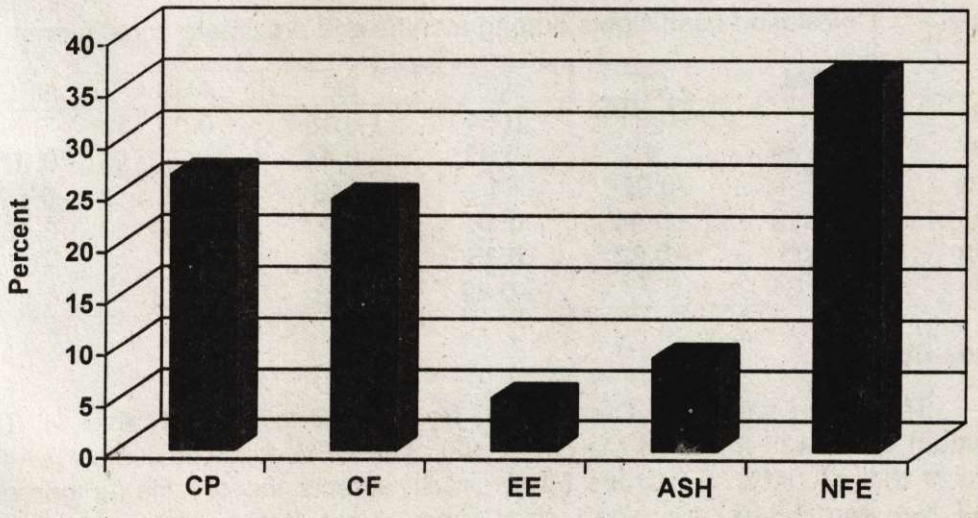

Fig.1. Chemical composition of Ipil-ipil

Crude protein

The mean values of CP% varied from 23.92 to 28.08. Minimum CP% was found in July. Higher values of CP% were found in March and September-November and were attributed to two growing seasons i.e. spring and post-monsoon. The newly sprouts of the tree branches are generally richer in protein content than the older ones. As shown in Table 3, there was a significant negative correlation between CP and CF values.

Table 2. Studentized "t" alongwith probability values for all combinations of months and proximate constituents

	Jan	Mar	May	Jul	Sep	Nov
DM	0.000 (P 1.000)	0.200 (P 0.849)	–0.415 (P 0.696)	–0.756 (P 0.484)	–00.452 (P 0.670)	–0.502 (P 0.637)
CP	–0.200 (P 0.849)	0.000 (1.000)	–0.291 (0.783)	–0.881 (P 0.419)	–0.916 (P 0.402)	–0.889 (P 0.415)
CF	0.415 (P 0.695)	0.291 (P 0.783)	0.000 (P 1.000)	–0.488 (P 0.646)	–0.303 (P 0.774)	–0.363 (P 0.732)
EE	0.756 (P 0.484)	0.881 (P 0.419)	0.488 (P 0.646)	0.000 (P 1.000)	0.000 (P 1.000)	–0.119 (P 0.910)
ASH	0.452 (P 0.670)	0.916 (P 0.402)	0.303 (P 0.774)	0.000 (P 1.000)	0.000 (P 1.000)	–0.542 (P 0.611)
NFE	0.502 (P 0.637)	0.889 (P 0.415)	0.363 (P 0.732)	0.119 (P 0.910)	0.542 (P 0.611)	0.000 (P 1.000)

Table 3. Correlation coefficients among months and proximate constituents

	DM	CP	CF	EE	ASH	NFE
Jan	1	–0.91*	0.64	–0.16	0.33	–0.64
Mar	–0.34	1	–0.92*	–0.44	–0.33	0.77
May	0.64	–0.92*	1	0.18	0.35	–0.89*
Jul	–0.16	–0.44	0.18	1	–0.64	0.13
Sep	0.33	–0.22	0.35	–0.64	1	–0.73
Nov	–0.64	0.77	–0.89	0.13	–0.73	1

Crude fibre

The mean values of CF% varied from 20.22 to 26.98 (Table 1). The minimum CF% was found in March (–0.92). The CF% followed almost similar trend to that of DM%. As Crude Fiber directly affects the dry matter percent, these two parameters supported each other. Light frost affects Ipil-ipil and

sometimes defoliates it (Anon, 1984). As shown in Table 3, there was a negative correlation between CF and NFE. More crude fiber values of December-January were attributed to the presence in excess of old leaves and twigs of Ipil-ipil.

Ether extract

The mean values of EE% varied from 4.12 to 5.90. Minimum EE% was found in September and it was attributed to more leaf growth in monsoon. As shown in Table 1, the maximum EE% was found in July and it can be attributed to synthesis of more fats for subsequent seed formation.

Ash

The mean values of ash % varied from 7.45 to 10.59. The minimum ash% was found in March and it was attributed to more utilization of minerals during growth season. During these months, there is more utilization and less storage of minerals. The values of EE% generally increased from July to November and it was attributed to more accumulation of minerals in mature and over-mature leaves.

Nitrogen-free extract

Mean values of NFE% varied from 32.91 to 37.90. The minimum NFE% was observed in May and the maximum in November. As evident from Table 1, the values of NFE%, that are mainly composed of organic matter, increased from May to November. It was attributed to more suitable conditions in May and November for the synthesis of organic matter for different nutrients of the tree.

Conclusion

The results revealed that overall variation in proximate constituents was statistically non-significant. DM percent was maximum in summer and minimum in autumn. CP and CF percent was highest in spring and post-monsoon months. Reverse was the case for NFE. However, EE and ASH percent was lesser in autumn. There was a significant negative correlation ($r = -0.89$) between CF and NFE. Another significant negative correlation was found between CP and CF ($r = -0.92$). As the CP and CF contents of twigs and leaves of a fodder tree affect its nutritive value, the maximum percentages of these constituents recommended that Ipil-ipil may serve better feeding values when utilized in summer and post-monsoon months.

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